

# SEQUENCE LISTING

<110> The Regents of the University of California

<120> HY2 FAMILY OF BILIN REDUCTASES

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<140> PCT/US01/18326

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<150> 09/870,406

<151> 2001-05-29

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<151> 2001-02-26

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<170> PatentIn version 3.0

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Ser Pro Leu Val Met Trp Thr Arg Phe Ser Ser Ser Lys Glu Lys His  
 195 200 205  
 Lys Ala Leu Phe Ser Ala Phe Leu Glu Tyr Tyr Gln Ala Trp Leu Glu  
 210 215 220  
 Met Thr Ile Gln Val Arg Glu Glu Met Glu Pro Ser His Val Arg Ala  
 225 230 235 240  
 Asn Cys Glu Ala Gln His Lys Tyr Leu Thr Trp Arg Ala Gln Lys Asp  
 245 250 255  
 Pro Gly His Gly Leu Leu Lys Arg Leu Val Gly Glu Ala Lys Ala Lys  
 260 265 270  
 Glu Leu Leu Arg Asp Phe Leu Phe Asn Gly Val Asp Glu Leu Gly Thr  
 275 280 285  
 Lys Thr Phe Ile Asp Tyr Phe Pro Glu Tyr Gln Thr Glu Asp Gly Thr  
 290 295 300  
 Val Ser Asp Lys Arg Ser Ile Ile Gly Lys Ser Tyr Glu Thr Arg Pro  
 305 310 315 320  
 Trp Asp Leu Thr Gly Gln Phe Ile Gly  
 325

<210> 35  
 <211> 236  
 <212> PRT  
 <213> Synechococcus sp.

<400> 35

Met Phe Asp Ser Phe Leu Asn Glu Leu His Ser Asp Ile Thr Lys Arg  
 1 5 10 15  
 Gly Gly Ser Pro Leu Pro Leu Pro Glu Gly Leu Glu Glu Cys Arg Ser  
 20 25 30  
 Ser Lys Ser Ser Ser Val Ile Gln Ser Trp Leu Trp Asp Val Pro Gly  
 35 40 45  
 Phe Arg Arg Trp Arg Val Thr Arg Leu Asp Ala Gly Asp Ser Leu Gln  
 50 55 60  
 Val Phe Asn Ser Val Ala Tyr Pro Asp Tyr Asn Tyr Asp His Pro Leu  
 65 70 75 80  
 Met Gly Val Asp Leu Leu Trp Phe Gly Ala Arg Gln Lys Leu Val Ala  
 85 90 95  
 Val Leu Asp Phe Gln Pro Leu Val Gln Asp Lys Asp Tyr Leu Asp Arg  
 100 105 110  
 Tyr Phe Ser Gly Leu Lys Glu Leu Asn Gln Arg Phe Pro Asp Leu Asn  
 115 120 125  
 Gly Glu Glu Thr Met Arg Ser Phe Asp Pro Asn Gln Tyr Phe Ser Ser

130		135		140
Trp Leu Leu Phe Cys Arg Gly Gly Ala Glu Gln Ala Asp Leu Ser Leu				
145		150		155
Pro Lys Ala Phe Ser Ala Phe Leu Lys Ala Tyr Trp Asp Leu His Asp				
	165		170	175
Asn Ala Lys Ser Ile Pro Ser Thr Ile Pro Pro Glu Glu Val Lys Asn				
	180		185	190
Leu Gln Asp Lys Tyr Asp Ile Tyr Ser Ala Glu Arg Asp Pro Ala His				
	195		200	205
Gly Leu Phe Thr Ser His Phe Gly Lys Asp Trp Ser Asn Arg Phe Leu				
	210		215	220
His Glu Phe Leu Phe Pro Ala Ser Ser Ser His Lys				
225		230		235
<210> 36				
<211> 241				
<212> PRT				
<213> Prochlorococcus marinus				
<400> 36				
Met Asn Lys Leu Met Leu Gln Asp Leu His Asn Asn Leu Lys Arg Arg				
1	5		10	15
Ile Ile Ser His Gly Gly Lys Pro Ile Glu Val Glu Asn Gly Met Ser				
	20		25	30
Glu Arg Phe Ser His Lys Gln Asp Thr Val Ile Lys Ser Trp Leu Trp				
	35		40	45
Asp Val Pro Gly Phe Arg Arg Trp Arg Val Thr Arg Met Asp Ala Gly				
	50		55	60
Asp Lys Leu Gln Val Leu Asn Ser Val Ala Tyr Pro Ala Tyr Thr Asn				
65		70		75
Asp Lys Pro Ile Leu Gly Ile Asp Ile Leu Trp Phe Gly Leu Lys Arg				
	85		90	95
Lys Leu Val Ala Val Leu Asp Phe Gln Pro Leu Val Gln Glu Glu Arg				
	100		105	110
Tyr Phe Cys Arg Tyr Tyr Lys Asp Leu Gln Ile Leu Lys Asn Arg Phe				
	115		120	125
Val Asp Phe Asn Ser Gln Lys Thr Met Lys Ile Tyr Asp Ser Asn Lys				
	130		135	140
Tyr Phe Ser Pro Trp Val Leu Leu Tyr Asn Gly Ser Phe Asp Asp Leu				
145		150		155
Gln Cys Ser Leu Ala Lys Ile Leu Asp Glu Phe Leu His Ala Tyr Trp				
	165		170	175



Gln Val Asp Asn Asn Asn Ser Arg Glu Tyr Ile Lys Ile Ile Pro Ser  
180 185 190

Lys Val Glu Gln Leu His Ile Asn Tyr Asp Ile Tyr Ser Ala Glu Arg  
195 200 205

Asp Pro Ala His Gly Leu Phe Lys Ser Tyr Phe Gly Gln Thr Trp Ala  
210 215 220

Asp Gln Phe Val Arg Glu Phe Leu Phe Pro His Ser His Leu Thr Ala  
225 230 235 240

Asp

<210> 37  
<211> 257  
<212> PRT  
<213> PROCHLOROCOCCUS MARINUS

<400> 37

Met Ile Ile Lys Arg Asp Asn Ser Leu Ser Lys Ile Asp Leu Arg Asp  
1 5 10 15

Trp Ile Trp Thr Pro Phe Phe Asn Asp Leu Val Asp Lys Leu Ser Val  
20 25 30

Phe Glu Ile Glu Pro Tyr Pro Val Ser His Asp Phe Leu Ser Lys Glu  
35 40 45

Ser Ile Thr Gly Ser Arg Arg Asn Pro Val His Val Thr Thr Leu Thr  
50 55 60

Trp Ala Ala Lys Phe Glu Lys Ile Lys Gln Val Arg Leu Ala Cys Ile  
65 70 75 80

Lys Gly Gly Glu Ser Leu Ser Val Phe Asn Leu Leu Ile His Pro Leu  
85 90 95

Asn Asp Tyr Asp Leu Pro Phe Phe Gly Ala Asp Phe Val Thr Leu Pro  
100 105 110

Asn Gly His Leu Leu Ala Leu Asp Leu Gln Pro Ala Leu Lys Leu Asp  
115 120 125

Asn Ile His Thr Glu Asn Val Trp Pro Arg Leu Ile Pro Leu His Asp  
130 135 140

His Trp Gln Ser Leu Leu Pro Ser Gly Gly Glu Ile Pro Lys Glu Ala  
145 150 155 160

Glu Pro Tyr Phe Ser Pro Gly Phe Leu Trp Ser Arg Leu Pro Leu Ser  
165 170 175

Lys Glu Ser Asp Asn Ile Ile Ser Glu Ile Leu Arg Pro Ala Phe Gly  
180 185 190

Glu Tyr Leu Ser Leu Tyr Ile Glu Leu Leu His Ile Ala Lys Pro Leu  
195 200 205

Lys Lys Glu Arg Ala Leu Lys Ile Leu Glu Gly Gln Lys Ala Tyr Ile  
 210 215 220  
 Asn Tyr Arg Ser Thr Lys Asp Pro Ala Arg Ala Met Leu Cys Arg Phe  
 225 230 235 240  
 Tyr Gly Lys Glu Trp Thr Glu Asp Tyr Ile His Lys Val Leu Phe Asn  
 245 250 255

Ile

<210> 38  
 <211> 257  
 <212> PRT  
 <213> Synechococcus sp.

<400> 38

Met Thr Asn Gln Arg Phe Lys Ser Thr Asp Pro Val Asn Ile Glu Gly  
 1 5 10 15  
 Trp Ser Trp Gln Pro Phe Leu Glu Asp Ala Ile Lys Arg Leu Glu Gly  
 20 25 30  
 Leu Asn Val Glu Pro Tyr Pro Val Pro Asp Arg Phe Leu Gln Arg Glu  
 35 40 45  
 Asp Gln Thr Gly Ser Lys Ser Lys Ser Ile Pro Val Thr Thr Ala Thr  
 50 55 60  
 Trp Ala Cys Lys Thr Glu Lys Phe Arg Gln Val Arg Ala Ala Cys Val  
 65 70 75 80  
 Ser Ala Gly Ser Ala Ala Ser Val Leu Asn Phe Val Ile Asn Pro Lys  
 85 90 95  
 Ser Thr Tyr Gly Leu Pro Phe Phe Gly Gly Asp Leu Val Thr Phe Pro  
 100 105 110  
 Ala Gly His Leu Leu Ala Leu Asp Leu Gln Pro Ala Ile Lys Thr Asp  
 115 120 125  
 Glu Val His Thr Thr His Val Trp Asp Arg Leu Ile Pro Ile Phe Glu  
 130 135 140  
 Arg Trp Arg Asp Gln Leu Pro Tyr Gly Gly Pro Ile Pro Glu Glu Ala  
 145 150 155 160  
 Gln Pro Phe Phe Ser Pro Gly Phe Leu Trp Thr Arg Leu Pro Leu Gly  
 165 170 175  
 Glu Glu Gly Asp Glu Leu Ile Gln Ser Ile Val Arg Pro Ala Phe Asn  
 180 185 190  
 Asp Tyr Leu Asp Leu Tyr Leu Glu Leu Ala Ala Ser Ala Glu Arg Val  
 195 200 205  
 Thr Asp Glu Arg Ser Glu Val Leu Leu Gln Gly Gln Arg Lys Tyr Thr

210	215	220
Asp Tyr Arg Ala Glu Lys Asp Pro Ala Arg Gly Met Leu Thr Arg Phe		
225	230	235 240
His Gly Ser Glu Trp Thr Glu Ala Tyr Ile His Thr Val Leu Phe Asp		
	245	250 255
Leu		
<210> 39		
<211> 248		
<212> PRT		
<213> Synechocystis sp.		
<400> 39		
Met Ala Val Thr Asp Leu Ser Leu Thr Asn Ser Ser Leu Met Pro Thr		
1	5	10 15
Leu Asn Pro Met Ile Gln Gln Leu Ala Leu Ala Ile Ala Ala Ser Trp		
	20	25 30
Gln Ser Leu Pro Leu Lys Pro Tyr Gln Leu Pro Glu Asp Leu Gly Tyr		
	35	40 45
Val Glu Gly Arg Leu Glu Gly Glu Lys Leu Val Ile Glu Asn Arg Cys		
	50	55 60
Tyr Gln Thr Pro Gln Phe Arg Lys Met His Leu Glu Leu Ala Lys Val		
65	70	75 80
Gly Lys Gly Leu Asp Ile Leu His Cys Val Met Phe Pro Glu Pro Leu		
	85	90 95
Tyr Gly Leu Pro Leu Phe Gly Cys Asp Ile Val Ala Gly Pro Gly Gly		
	100	105 110
Val Ser Ala Ala Ile Ala Asp Leu Ser Pro Thr Gln Ser Asp Arg Gln		
	115	120 125
Leu Pro Ala Ala Tyr Gln Lys Ser Leu Ala Glu Leu Gly Gln Pro Glu		
	130	135 140
Phe Glu Gln Gln Arg Glu Leu Pro Pro Trp Gly Glu Ile Phe Ser Glu		
145	150	155 160
Tyr Cys Leu Phe Ile Arg Pro Ser Asn Val Thr Glu Glu Glu Arg Phe		
	165	170 175
Val Gln Arg Val Val Asp Phe Leu Gln Ile His Cys His Gln Ser Ile		
	180	185 190
Val Ala Glu Pro Leu Ser Glu Ala Gln Thr Leu Glu His Arg Gln Gly		
	195	200 205
Gln Ile His Tyr Cys Gln Gln Gln Gln Lys Asn Asp Lys Thr Arg Arg		
	210	215 220

Val Leu Glu Lys Ala Phe Gly Glu Ala Trp Ala Glu Arg Tyr Met Ser  
 225 230 235 240

Gln Val Leu Phe Asp Val Ile Gln  
 245

<210> 40  
 <211> 490  
 <212> PRT  
 <213> Anabaena sp.

<400> 40

Met Ser Leu Thr Ser Ile Pro Ser Leu Arg Glu Gln Gln His Pro Leu  
 1 5 10 15  
 Ile Arg Gln Leu Ala Asp Cys Ile Glu Glu Val Trp His Gln His Leu  
 20 25 30  
 Asp Leu Ser Pro Tyr His Leu Pro Ala Glu Leu Gly Tyr Val Glu Gly  
 35 40 45  
 Arg Leu Glu Gly Glu Lys Leu Thr Ile Glu Asn Arg Cys Tyr Gln Thr  
 50 55 60  
 Pro Gln Phe Arg Lys Met His Leu Glu Leu Ala Lys Val Gly Asn Met  
 65 70 75 80  
 Leu Asp Ile Leu His Cys Val Met Phe Pro Arg Pro Glu Tyr Asp Leu  
 85 90 95  
 Pro Met Phe Gly Cys Asp Leu Val Gly Gly Arg Gly Gln Ile Ser Ala  
 100 105 110  
 Ala Ile Ala Asp Leu Ser Pro Val His Leu Asp Arg Thr Leu Pro Glu  
 115 120 125  
 Ser Tyr Asn Ser Ala Leu Thr Ser Leu Asn Thr Leu Asn Phe Ser Gln  
 130 135 140  
 Pro Arg Glu Leu Pro Glu Trp Gly Asn Ile Phe Ser Asp Phe Cys Ile  
 145 150 155 160  
 Phe Val Arg Pro Ser Ser Pro Glu Glu Glu Ala Met Phe Leu Gly Arg  
 165 170 175  
 Val Arg Glu Phe Leu Gln Val His Cys Gln Gly Ala Ile Ala Ala Ser  
 180 185 190  
 Pro Val Ser Ala Glu Gln Lys Gln Gln Ile Leu Ala Gly Gln His Asn  
 195 200 205  
 Tyr Cys Ser Lys Gln Gln Gln Asn Asp Lys Thr Arg Arg Val Leu Glu  
 210 215 220  
 Lys Ala Phe Gly Val Asp Trp Ala Glu Asn Tyr Met Thr Thr Val Leu  
 225 230 235 240  
 Phe Asp Leu Pro Glu Met Ser Leu Thr Ser Ile Pro Ser Leu Arg Glu  
 245 250 255

Gln Gln His Pro Leu Ile Arg Gln Leu Ala Asp Cys Ile Glu Glu Val  
 260 265 270  
 Trp His Gln His Leu Asp Leu Ser Pro Tyr His Leu Pro Ala Glu Leu  
 275 280 285  
 Gly Tyr Val Glu Gly Arg Leu Glu Gly Glu Lys Leu Thr Ile Glu Asn  
 290 295 300  
 Arg Cys Tyr Gln Thr Pro Gln Phe Arg Lys Met His Leu Glu Leu Ala  
 305 310 315 320  
 Lys Val Gly Asn Met Leu Asp Ile Leu His Cys Val Met Phe Pro Arg  
 325 330 335  
 Pro Glu Tyr Asp Leu Pro Met Phe Gly Cys Asp Leu Val Gly Gly Arg  
 340 345 350  
 Gly Gln Ile Ser Ala Ala Ile Ala Asp Leu Ser Pro Val His Leu Asp  
 355 360 365  
 Arg Thr Leu Pro Glu Ser Tyr Asn Ser Ala Leu Thr Ser Leu Asn Thr  
 370 375 380  
 Leu Asn Phe Ser Gln Pro Arg Glu Leu Pro Glu Trp Gly Asn Ile Phe  
 385 390 395 400  
 Ser Asp Phe Cys Ile Phe Val Arg Pro Ser Ser Pro Glu Glu Glu Ala  
 405 410 415  
 Met Phe Leu Gly Arg Val Arg Glu Phe Leu Gln Val His Cys Gln Gly  
 420 425 430  
 Ala Ile Ala Ala Ser Pro Val Ser Ala Glu Gln Lys Gln Gln Ile Leu  
 435 440 445  
 Ala Gly Gln His Asn Tyr Cys Ser Lys Gln Gln Gln Asn Asp Lys Thr  
 450 455 460  
 Arg Arg Val Leu Glu Lys Ala Phe Gly Val Asp Trp Ala Glu Asn Tyr  
 465 470 475 480  
 Met Thr Thr Val Leu Phe Asp Leu Pro Glu  
 485 490

<210> 41  
 <211> 245  
 <212> PRT  
 <213> Nostoc punctiforme

<400> 41

Met Ser Phe Thr Ser Met Pro Ser Leu Arg Glu Gln Gln His Pro Leu  
 1 5 10 15  
 Ile Arg Gln Leu Ala Asp Cys Ile Glu Ala Ala Trp His Gln His Leu  
 20 25 30  
 Asp Leu Ser Pro Tyr His Leu Pro Asp Glu Leu Gly Tyr Val Glu Gly

35					40					45					
Arg	Leu	Glu	Gly	Glu	Lys	Leu	Thr	Ile	Glu	Asn	Arg	Cys	Tyr	Gln	Thr
50					55					60					
Pro	Gln	Phe	Arg	Lys	Met	His	Leu	Glu	Leu	Ala	Asn	Ile	Gly	Asn	Met
65				70						75					80
Leu	Asp	Ile	Leu	His	Cys	Val	Met	Phe	Pro	Arg	Pro	Gln	Tyr	Asn	Leu
				85					90					95	
Pro	Met	Phe	Gly	Cys	Asp	Leu	Val	Gly	Gly	Arg	Gly	Gln	Ile	Ser	Ala
			100					105					110		
Ala	Ile	Ala	Asp	Leu	Ser	Pro	Ile	Gln	Leu	Glu	Arg	Thr	Leu	Pro	Glu
		115					120					125			
Ser	Tyr	Thr	Thr	Ala	Leu	Ala	Gln	Leu	Pro	Val	Leu	Asn	Phe	Ser	Gln
	130					135					140				
Pro	Arg	Glu	Leu	Pro	Glu	Trp	Gly	Asn	Ile	Phe	Ser	Asp	Phe	Cys	Ile
145				150						155					160
Phe	Val	Arg	Pro	Gly	Ser	Pro	Glu	Glu	Glu	Ala	Met	Phe	Leu	Ser	Arg
				165				170						175	
Val	Arg	Glu	Phe	Leu	Asp	Ile	His	Cys	Met	Gln	Ala	Ile	Ala	Ser	His
		180						185				190			
Pro	Val	Ser	Val	Glu	Gln	Val	Thr	Gln	Asn	Leu	Ala	Gly	Gln	His	Asn
	195					200						205			
Tyr	Cys	Thr	Lys	Gln	Gln	Gln	Asn	Asp	Lys	Thr	Arg	Arg	Val	Leu	Glu
	210				215					220					
Lys	Ala	Phe	Gly	Pro	Val	Trp	Ala	Glu	Asn	Tyr	Met	Thr	Thr	Val	Leu
225				230					235					240	
Phe	Asp	Leu	Pro	Thr											
				245											

<210> 42  
 <211> 248  
 <212> PRT  
 <213> Synechocystis sp.

<400> 42

Met	Ala	Val	Thr	Asp	Leu	Ser	Leu	Thr	Asn	Ser	Ser	Leu	Met	Pro	Thr
1				5					10					15	
Leu	Asn	Pro	Met	Ile	Gln	Gln	Leu	Ala	Leu	Ala	Ile	Ala	Ala	Ser	Trp
		20					25					30			
Gln	Ser	Leu	Pro	Leu	Lys	Pro	Tyr	Gln	Leu	Pro	Glu	Asp	Leu	Gly	Tyr
	35					40					45				
Val	Glu	Gly	Arg	Leu	Glu	Gly	Glu	Lys	Leu	Val	Ile	Glu	Asn	Arg	Cys
50					55					60					

Tyr Gln Thr Pro Gln Phe Arg Lys Met His Leu Glu Leu Ala Lys Val  
 65 70 75 80  
 Gly Lys Gly Leu Asp Ile Leu His Cys Val Met Phe Pro Glu Pro Leu  
 85 90 95  
 Tyr Gly Leu Pro Leu Phe Gly Cys Asp Ile Val Ala Gly Pro Gly Gly  
 100 105 110  
 Val Ser Ala Ala Ile Ala Asp Leu Ser Pro Thr Gln Ser Asp Arg Gln  
 115 120 125  
 Leu Pro Ala Ala Tyr Gln Lys Ser Leu Ala Glu Leu Gly Gln Pro Glu  
 130 135 140  
 Phe Glu Gln Gln Arg Glu Leu Pro Pro Trp Gly Glu Ile Phe Ser Glu  
 145 150 155 160  
 Tyr Cys Leu Phe Ile Arg Pro Ser Asn Val Thr Glu Glu Glu Arg Phe  
 165 170 175  
 Val Gln Arg Val Val Asp Phe Leu Gln Ile His Cys His Gln Ser Ile  
 180 185 190  
 Val Ala Glu Pro Leu Ser Glu Ala Gln Thr Leu Glu His Arg Gln Gly  
 195 200 205  
 Gln Ile His Tyr Cys Gln Gln Gln Gln Lys Asn Asp Lys Thr Arg Arg  
 210 215 220  
 Val Leu Glu Lys Ala Phe Gly Glu Ala Trp Ala Glu Arg Tyr Met Ser  
 225 230 235 240  
 Gln Val Leu Phe Asp Val Ile Gln  
 245

<210> 43  
 <211> 247  
 <212> PRT  
 <213> Synechocystis sp.

<400> 43

Met Gln Ser Pro Pro Ser Glu Ser Ser Ser Thr Val Ala Pro Leu Ile  
 1 5 10 15  
 Pro Ser Leu Ala Glu Thr Ile Arg Gly Ala Trp Ile Gly Leu Pro Glu  
 20 25 30  
 Leu Lys Pro Leu Asp Ala Asp Ser Asp Phe Ser Ser Ile Glu Gly Gln  
 35 40 45  
 Leu Glu Gly Asp Asp Leu Leu Ile Arg Asn Glu Leu Leu Cys Cys Arg  
 50 55 60  
 Val Gly Arg Lys Ile His Leu Glu Leu Ala Arg Leu Gly Arg Gly Leu  
 65 70 75 80  
 Gln Ile Leu His Cys Val Trp Phe Pro Asp Pro Arg Phe Asp Leu Pro  
 85 90 95

Ile Phe Gly Ala Asp Ile Val Ala Gly Pro Ala Gly Val Ser Ala Ala  
 100 105 110  
 Ile Val Asp Leu Ser Pro Val Ser Gly Thr Leu Pro Ser Gly Ile Glu  
 115 120 125  
 Thr Ala Leu Ala Gly Thr Pro Ser Pro Ala Phe Arg Gln Val Arg Asp  
 130 135 140  
 Leu Pro Gly Trp Gly Thr Ile Phe Ser Pro His Val Cys Phe Ile Arg  
 145 150 155 160  
 Pro Asp Gly Ala Glu Glu Glu Val Leu Phe Arg Ser Arg Val Glu Glu  
 165 170 175  
 Val Leu Thr Ile Leu Arg Thr Ala Val Leu Gln Thr Ala Cys Glu Pro  
 180 185 190  
 Ala Thr Ala Ala Ser Thr Ile Arg Arg Tyr Glu Gly Gln Leu Ser Tyr  
 195 200 205  
 Cys Leu Gln Gln Lys Arg Asn Asp Lys Thr Arg Arg Val Leu Glu Lys  
 210 215 220  
 Ala Phe Asp Ala Ser Trp Ala Asp Arg Tyr Ile Glu Glu Leu Leu Phe  
 225 230 235 240  
 Asp Asp Pro Leu Pro Pro Gly  
 245

<210> 44  
 <211> 243  
 <212> PRT  
 <213> Prochlorococcus marinus

<400> 44

Leu Asn Leu Leu Ser Lys Ser Leu Thr Lys Thr Lys Leu Ile Asp Pro  
 1 5 10 15  
 Leu Ile Leu Thr Leu Leu Gln Asn Ile Lys Val Gln Arg Ser Lys Leu  
 20 25 30  
 Asn Asp Leu Asn Cys Ile Glu Val Asp Pro Lys Leu Ser Asn Ile Ile  
 35 40 45  
 Ser Asn Glu Glu Gly Lys Glu Leu Tyr Ile Glu Asn Glu Phe Tyr Lys  
 50 55 60  
 Ala Lys Gly Phe Arg Lys Leu His Ile Glu Val Ala Glu Phe Ser Lys  
 65 70 75 80  
 Ser Leu Lys Ile Leu His Cys Val Phe Phe Pro Asp Pro Lys Tyr Asp  
 85 90 95  
 Ile Pro Ile Phe Gly Met Asp Leu Val Lys Val Asn Glu Leu Val Ser  
 100 105 110  
 Ala Ala Ile Val Asp Leu Ser Pro Ser Ser Lys Asn Gln Asn Leu Lys



115					120					125					
Tyr	Asp	His	Leu	Leu	Ser	His	Ile	Asp	Lys	Ser	Val	Phe	Lys	Ser	Lys
130						135					140				
Arg	Glu	Ile	Pro	Ile	Trp	Gly	Asn	Ile	Phe	Ser	Lys	Asn	Val	Phe	Phe
145					150					155					160
Ala	Ser	Leu	Lys	Asn	Glu	Ser	Glu	Lys	Asn	Ala	Phe	Cys	Lys	Ile	Val
				165					170					175	
Asp	Asn	Tyr	Leu	Ser	Val	Leu	Ile	Gln	Leu	Ser	Gln	Ser	Thr	Ser	Pro
			180					185					190		
Asp	Ser	Asp	Tyr	Glu	Ile	Ile	Glu	Glu	Arg	Ile	Asn	Tyr	Gln	Lys	Asn
		195					200					205			
Tyr	Cys	Val	Gln	Gln	Met	Lys	Asn	Glu	Lys	Thr	Ser	Leu	Val	Leu	Leu
	210					215					220				
Lys	Tyr	Phe	Asp	Lys	Val	Trp	Val	Asp	Glu	Tyr	Ile	Lys	Lys	Val	Leu
225					230					235					240

Phe Asp Phe

<210> 45  
 <211> 236  
 <212> PRT  
 <213> Synechocystis sp.

<400> 45

Met	Phe	Asp	Ser	Phe	Leu	Asn	Glu	Leu	His	Ser	Asp	Ile	Thr	Lys	Arg
1				5					10					15	
Gly	Gly	Ser	Pro	Leu	Pro	Leu	Pro	Glu	Gly	Leu	Glu	Glu	Cys	Arg	Ser
			20					25					30		
Ser	Lys	Ser	Ser	Ser	Val	Ile	Gln	Ser	Trp	Leu	Trp	Asp	Val	Pro	Gly
		35					40					45			
Phe	Arg	Arg	Trp	Arg	Val	Thr	Arg	Leu	Asp	Ala	Gly	Asp	Ser	Leu	Gln
	50					55					60				
Val	Phe	Asn	Ser	Val	Ala	Tyr	Pro	Asp	Tyr	Asn	Tyr	Asp	His	Pro	Leu
65					70				75						80
Met	Gly	Val	Asp	Leu	Leu	Trp	Phe	Gly	Ala	Arg	Gln	Lys	Leu	Val	Ala
				85					90					95	
Val	Leu	Asp	Phe	Gln	Pro	Leu	Val	Gln	Asp	Lys	Asp	Tyr	Leu	Asp	Arg
			100					105					110		
Tyr	Phe	Ser	Gly	Leu	Lys	Glu	Leu	Asn	Gln	Arg	Phe	Pro	Asp	Leu	Asn
		115					120					125			
Gly	Glu	Glu	Thr	Met	Arg	Ser	Phe	Asp	Pro	Asn	Gln	Tyr	Phe	Ser	Ser
	130					135					140				

Trp Leu Leu Phe Cys Arg Gly Gly Ala Glu Gln Ala Asp Leu Ser Leu  
145 150 155 160

Pro Lys Ala Phe Ser Ala Phe Leu Lys Ala Tyr Trp Asp Leu His Asp  
165 170 175

Asn Ala Lys Ser Ile Pro Ser Thr Ile Pro Pro Glu Glu Val Lys Asn  
180 185 190

Leu Gln Asp Lys Tyr Asp Ile Tyr Ser Ala Glu Arg Asp Pro Ala His  
195 200 205

Gly Leu Phe Thr Ser His Phe Gly Lys Asp Trp Ser Asn Arg Phe Leu  
210 215 220

His Glu Phe Leu Phe Pro Ala Ser Ser Ser His Lys  
225 230 235

<210> 46

<211> 235

<212> PRT

<213> Synechocystis sp.

<400> 46

Met Phe Asp Pro Phe Leu Glu Glu Leu Gln Thr Gly Ile Gln Ala Arg  
1 5 10 15

Gly Gly Ile Ser Val Glu Val Pro Ala Gly Leu Glu His Asn Gln Ser  
20 25 30

Gln Lys Gly Ser Ser Thr Ile Gln Ser Trp Leu Trp Gln Val Pro Gly  
35 40 45

Phe Arg Arg Trp Arg Val Thr Arg Leu Asp Ala Gly Asp Ser Leu Gln  
50 55 60

Val Leu Asn Ser Val Ala Tyr Pro Asp Phe Asp Leu Asp His Pro Leu  
65 70 75 80

Met Gly Val Asp Leu Leu Trp Phe Gly Ala Arg Gln Lys Leu Val Ala  
85 90 95

Val Leu Asp Phe Gln Pro Leu Val Gln Asp Lys Asp Tyr Leu Asp Arg  
100 105 110

His Phe Asp Gly Leu Lys Asp Leu Asn Ala Arg Phe Pro Asp Leu Asn  
115 120 125

Gly Glu Glu Thr Met Arg Ser Phe Asp Pro Asn Gln Tyr Phe Ser Ser  
130 135 140

Trp Leu Leu Phe Cys Arg Gly Gly Ser Glu Glu Ala Asp Arg Ser Leu  
145 150 155 160

Pro Lys Ala Phe Ser Ala Phe Leu Lys Ala Tyr Trp Gly Leu His Asp  
165 170 175

Glu Ala Ser Lys Glu Pro Ser Ser Ile Ser Pro Gly Asp Val Glu Arg  
180 185 190

Leu Gln Asn Ala Tyr Asp Val Tyr Ser Ala Glu Arg Asp Pro Ala His  
 195 200 205

Gly Leu Phe Thr Ser His Phe Gly Lys Glu Trp Ser Asp Arg Phe Leu  
 210 215 220

His Glu Phe Leu Phe Pro Ala Ser Gln Pro Ala  
 225 230 235

<210> 47

<211> 241

<212> PRT

<213> Prochlorococcus sp.

<400> 47

Met Asn Lys Leu Met Leu Gln Asp Leu His Asn Asn Leu Lys Arg Arg  
 1 5 10 15

Ile Ile Ser His Gly Gly Lys Pro Ile Glu Val Glu Asn Gly Met Ser  
 20 25 30

Glu Arg Phe Ser His Lys Gln Asp Thr Val Ile Lys Ser Trp Leu Trp  
 35 40 45

Asp Val Pro Gly Phe Arg Arg Trp Arg Val Thr Arg Met Asp Ala Gly  
 50 55 60

Asp Lys Leu Gln Val Leu Asn Ser Val Ala Tyr Pro Ala Tyr Thr Asn  
 65 70 75 80

Asp Lys Pro Ile Leu Gly Ile Asp Ile Leu Trp Phe Gly Leu Lys Arg  
 85 90 95

Lys Leu Val Ala Val Leu Asp Phe Gln Pro Leu Val Gln Glu Glu Arg  
 100 105 110

Tyr Phe Cys Arg Tyr Tyr Lys Asp Leu Gln Ile Leu Lys Asn Arg Phe  
 115 120 125

Val Asp Phe Asn Ser Gln Lys Thr Met Lys Ile Tyr Asp Ser Asn Lys  
 130 135 140

Tyr Phe Ser Pro Trp Val Leu Leu Tyr Asn Gly Ser Phe Asp Asp Leu  
 145 150 155 160

Gln Cys Ser Leu Ala Lys Ile Leu Asp Glu Phe Leu His Ala Tyr Trp  
 165 170 175

Gln Val Asp Asn Asn Asn Ser Arg Glu Tyr Ile Lys Ile Ile Pro Ser  
 180 185 190

Lys Val Glu Gln Leu His Ile Asn Tyr Asp Ile Tyr Ser Ala Glu Arg  
 195 200 205

Asp Pro Ala His Gly Leu Phe Lys Ser Tyr Phe Gly Gln Thr Trp Ala  
 210 215 220

Asp Gln Phe Val Arg Glu Phe Leu Phe Pro His Ser His Leu Thr Ala



<213> Nostoc punctiforme

<400> 49

Met	Leu	Asn	Ser	Gln	Ser	Pro	Leu	Arg	Asn	Val	Ala	Leu	Phe	Leu	Ile	
1				5					10					15		
Asn	Glu	Thr	Cys	Met	Ile	Ala	Ile	Thr	Tyr	Phe	His	Ala	Arg	Val	Asn	
			20					25					30			
Lys	Ser	Cys	Ser	Met	Tyr	Lys	Pro	Phe	Leu	Glu	Phe	Leu	Glu	Lys	Glu	
		35					40					45				
Leu	Phe	Gln	Arg	Phe	Asp	Leu	Gln	Ser	Arg	Val	Ile	Pro	Pro	Gly	Leu	
	50					55					60					
Glu	Phe	Lys	Val	Ser	Asp	Arg	Gly	Arg	Asn	Pro	Ala	Thr	Ile	Arg	Ser	
65					70				75						80	
Trp	Cys	Tyr	Gln	Ser	Gln	Glu	Leu	Arg	Lys	Ile	Arg	Tyr	Thr	Tyr	Ile	
				85					90					95		
Asp	Ala	Gly	Glu	Ser	Ala	Gln	Ile	Phe	Asn	Ser	Val	Val	Tyr	Pro	Ser	
			100					105					110			
His	Asn	Tyr	Asp	Leu	Pro	Leu	Leu	Gly	Ile	Asp	Phe	Leu	Ser	Phe	Gly	
		115					120					125				
Lys	Val	Lys	Asn	Leu	Ile	Val	Leu	Asp	Phe	Gln	Pro	Leu	Phe	Gln	Asp	
	130					135					140					
Glu	Asp	Tyr	Gln	Asn	Lys	Tyr	Ile	Ala	Pro	Leu	Lys	Tyr	Leu	His	Asn	
145					150					155					160	
Lys	Tyr	Pro	Asp	Leu	Ala	Gln	Asn	Leu	Glu	Met	Lys	Phe	Tyr	Asp	Ala	
				165					170					175		
Asn	Gln	Tyr	Phe	Ser	Lys	Tyr	Leu	Leu	Phe	Ala	Lys	Thr	Asp	Ala	Glu	
			180					185					190			
Thr	Val	Ser	Thr	Arg	Val	Phe	Glu	Ala	Phe	Gln	Asp	Tyr	Leu	Asn	Leu	
		195					200					205				
Tyr	Trp	Gln	Met	Leu	Ala	Asp	Ala	Gln	Ala	Leu	His	Asp	Pro	Glu	Asp	
	210					215					220					
Ile	Gln	Arg	Ile	Val	Lys	Ala	Gln	Lys	Asp	Tyr	Asp	Gln	Tyr	Ser	Ala	
225					230					235					240	
Asp	Arg	Asp	Pro	Ala	Ser	Gly	Leu	Phe	Ser	Ser	Tyr	Phe	Gly	His	Glu	
				245					250					255		
Trp	Ala	Glu	Arg	Phe	Leu	His	Glu	Phe	Leu	Phe	Glu	Asp	Ala	Val	Pro	
			260					265					270			
Leu	Ala	Val	Ser	Ala	Ser	Lys	Arg									
		275					280									

<210> 50

<211> 257



<400> 51

Met Ser Ile Asp Leu Arg Ala Ser Ser Leu Asp Pro Val Gln Ile Pro  
1 5 10 15  
Gly Trp Arg Trp Gln Pro Phe Leu Asp Glu Ala Ser Ala Ala Leu Lys  
20 25 30  
Pro Phe Asn Pro Ser Pro Tyr Pro Ile Ala Glu Thr Phe Leu Gln Lys  
35 40 45  
Glu Gly Ser Thr Gly Ser Lys Ala Lys Pro Val Pro Val Thr Thr Ala  
50 55 60  
Thr Trp Ala Cys Ser Thr Asp Lys Leu Arg Gln Val Arg Cys Ala Cys  
65 70 75 80  
Val Glu Ala Gly Met Ala Ala Ser Val Leu Asn Phe Val Ile Asn Pro  
85 90 95  
Ser Cys Arg Phe Asp Leu Pro Phe Phe Gly Ala Asp Leu Val Thr Leu  
100 105 110  
Pro Asn Gly His Leu Leu Ala Leu Asp Leu Gln Pro Val Asp Lys Ala  
115 120 125  
Asp Pro Asp His Thr Gln Pro Val Trp Glu Arg Leu Met Pro Leu Phe  
130 135 140  
Glu Arg Trp Gln Ala Glu Leu Pro Asp Gly Gly Pro Ile Pro Glu Glu  
145 150 155 160  
Ala Gln Pro Tyr Phe Ser Pro Ala Phe Leu Trp Thr Arg Ile Pro Leu  
165 170 175  
Gly Glu Glu Gly Asp Glu Leu Ile Glu Arg Val Ile Arg Pro Ala Phe  
180 185 190  
Ile Asp Tyr Leu Gln Leu Tyr Leu Asn Leu Val Ala Glu Ala Glu Pro  
195 200 205  
Val Ser Asp Asp Arg Ala Glu Leu Leu Leu Ser Gly Gln Lys Arg Tyr  
210 215 220  
Thr Ala Tyr Arg Ala Glu Lys Asp Pro Ala Arg Gly Met Leu Thr Arg  
225 230 235 240  
Phe Tyr Gly Ser Glu Trp Thr Glu Ser Tyr Ile His Gly Val Leu Phe  
245 250 255  
Asp Leu Glu Asp Ala Ala  
260

<210> 52

<211> 257

<212> PRT

<213> Prochlorococcus marinus

<400> 52

Met Ile Ile Lys Arg Asp Asn Ser Leu Ser Lys Ile Asp Leu Arg Asp  
 1 5 10 15  
 Trp Ile Trp Thr Pro Phe Phe Asn Asp Leu Val Asp Lys Leu Ser Val  
 20 25 30  
 Phe Glu Ile Glu Pro Tyr Pro Val Ser His Asp Phe Leu Ser Lys Glu  
 35 40 45  
 Ser Ile Thr Gly Ser Arg Arg Asn Pro Val His Val Thr Thr Leu Thr  
 50 55 60  
 Trp Ala Ala Lys Phe Glu Lys Ile Lys Gln Val Arg Leu Ala Cys Ile  
 65 70 75 80  
 Lys Gly Gly Glu Ser Leu Ser Val Phe Asn Leu Leu Ile His Pro Leu  
 85 90 95  
 Asn Asp Tyr Asp Leu Pro Phe Phe Gly Ala Asp Phe Val Thr Leu Pro  
 100 105 110  
 Asn Gly His Leu Leu Ala Leu Asp Leu Gln Pro Ala Leu Lys Leu Asp  
 115 120 125  
 Asn Ile His Thr Glu Asn Val Trp Pro Arg Leu Ile Pro Leu His Asp  
 130 135 140  
 His Trp Gln Ser Leu Leu Pro Ser Gly Gly Glu Ile Pro Lys Glu Ala  
 145 150 155 160  
 Glu Pro Tyr Phe Ser Pro Gly Phe Leu Trp Ser Arg Leu Pro Leu Ser  
 165 170 175  
 Lys Glu Ser Asp Asn Ile Ile Ser Glu Ile Leu Arg Pro Ala Phe Gly  
 180 185 190  
 Glu Tyr Leu Ser Leu Tyr Ile Glu Leu Leu His Ile Ala Lys Pro Leu  
 195 200 205  
 Lys Lys Glu Arg Ala Leu Lys Ile Leu Glu Gly Gln Lys Ala Tyr Ile  
 210 215 220  
 Asn Tyr Arg Ser Thr Lys Asp Pro Ala Arg Ala Met Leu Cys Arg Phe  
 225 230 235 240  
 Tyr Gly Lys Glu Trp Thr Glu Asp Tyr Ile His Lys Val Leu Phe Asn  
 245 250 255  
 Ile

<210> 53  
 <211> 257  
 <212> PRT  
 <213> Prochlorococcus sp.

<400> 53

Met Leu Ile Gln Asn Thr Ile Phe Tyr Ser Gln Glu Trp Arg Trp Ala



1	5	10	15
Lys Phe Ile	Lys Phe Leu Ile	Ser Gln Leu Asp Asn Tyr	His Cys Val
20		25	30
Glu His Lys	Ile Ala Ser Asp Phe	Ser Tyr Lys Glu	Ser Ser Tyr Gly
35		40	45
Ser Lys Lys	Ser Lys Lys Asn Ile	Asn Leu Phe Thr	Trp Gly Ala Thr
50		55	60
His Gln Lys	Arg Ile Asn Phe Ala Arg	Ala Val Cys Ile	Asn Ser Pro
65		70	75
Asn Tyr Ser	Val Leu Asn Phe Leu Ile	Ile Pro Lys Thr	Ser Tyr Asn
	85	90	95
Ile Pro Phe	Leu Gly Val Asp Phe	Val Ser Leu Pro	Thr Ser His Leu
	100	105	110
Leu Val Leu	Asp Phe Gln Pro Ser	Leu Lys Val Glu	Asn Gln Phe Asn
	115	120	125
Ser Glu Leu	Leu Glu Gln Ile Ile	Lys Leu Lys Lys	Ser Cys His Ser
130		135	140
Ser Leu Pro	Val Ala Glu Lys Met	Ser Glu Gln Val	Ala Lys Phe Phe
145		150	155
Ser Pro Gly	Leu Ile Trp Ser Arg	Leu Ala Lys His	Gln Asp Ser Asp
	165	170	175
Asn Leu Ile	Glu Asn Gln Leu Tyr	Asp Ser Phe Lys	Glu Tyr Leu Asn
	180	185	190
Leu Tyr Leu	Lys Thr Leu Phe Glu	Ser Glu Glu Val	Gly His Gly Leu
	195	200	205
Gln Gln Glu	Leu Ile Asn Gly Gln	Asn Asp Tyr Leu	Asn Tyr Arg Arg
210		215	220
Asp Asn Asp	Pro Ala Arg Pro Met	Leu Ser Ser Leu	Phe Gly Lys Asp
225		230	235
Phe Thr Glu	Ser Leu Ile Asn Lys	Val Leu Phe Ser	Thr Asn Lys Val
	245	250	255

Leu

<210> 54  
 <211> 255  
 <212> PRT  
 <213> Nostoc punctiforme

<400> 54

Met Asn Ser	Glu Arg Ser Asp	Val Thr Leu Tyr	Gln Pro Phe	Leu Asp
1	5	10	15	

Tyr Ala Ile Ala Tyr Met Arg Ser Arg Leu Asp Leu Glu Pro Tyr Pro  
                   20                                  25                                  30  
 Ile Pro Thr Gly Phe Glu Ser Asn Ser Ala Val Val Gly Lys Gly Lys  
                   35                                  40                                  45  
 Asn Gln Glu Glu Val Val Thr Thr Ser Tyr Ala Phe Gln Thr Ala Lys  
                   50                                  55                                  60  
 Leu Arg Gln Ile Arg Ala Ala His Val Gln Gly Gly Asn Ser Leu Gln  
                   65                                  70                                  75                                  80  
 Val Leu Asn Phe Val Ile Phe Pro His Leu Asn Tyr Asp Leu Pro Phe  
                                   85                                  90                                  95  
 Phe Gly Ala Asp Leu Val Thr Leu Pro Gly Gly His Leu Ile Ala Leu  
                                   100                                  105                                  110  
 Asp Met Gln Pro Leu Phe Arg Asp Asp Ser Ala Tyr Gln Ala Lys Tyr  
                   115                                  120                                  125  
 Thr Glu Pro Ile Leu Pro Ile Phe His Ala His Gln Gln His Leu Ser  
                   130                                  135                                  140  
 Trp Gly Gly Asp Phe Pro Glu Glu Ala Gln Pro Phe Phe Ser Pro Ala  
                   145                                  150                                  155                                  160  
 Phe Leu Trp Thr Arg Pro Gln Glu Thr Ala Val Val Glu Thr Gln Val  
                                   165                                  170                                  175  
 Phe Ala Ala Phe Lys Asp Tyr Leu Lys Ala Tyr Leu Asp Phe Val Glu  
                                   180                                  185                                  190  
 Gln Ala Glu Ala Val Thr Asp Ser Gln Asn Leu Val Ala Ile Lys Gln  
                   195                                  200                                  205  
 Ala Gln Leu Arg Tyr Leu Arg Tyr Arg Ala Glu Lys Asp Pro Ala Arg  
                   210                                  215                                  220  
 Gly Met Phe Lys Arg Phe Tyr Gly Ala Glu Trp Thr Glu Glu Tyr Ile  
                   225                                  230                                  235                                  240  
 His Gly Phe Leu Phe Asp Leu Glu Arg Lys Leu Thr Val Val Lys  
                                   245                                  250                                  255

<210> 55  
 <211> 329  
 <212> PRT  
 <213> Arapidopsis thaliana

<400> 55

Met Ala Leu Ser Met Glu Phe Gly Phe Ser Ile Gly Ser Cys Phe Lys  
 1                                  5                                  10                                  15  
 Ala Pro Asn Pro Pro Val Leu Ile Ser Ala Ser Pro Asn Lys Ile Asn  
                   20                                  25                                  30  
 Phe Thr Leu Arg Arg Arg Lys Lys Arg Phe Leu Leu Arg Val Ser Ala  
                   35                                  40                                  45

Val Ser Tyr Lys Glu Phe Ala Glu Ser Ala Leu Glu Glu Thr Arg Lys  
 50 55 60  
 Arg Ile Val Leu Glu Pro Ser His Leu Gln Glu Lys Tyr Ser Ser Met  
 65 70 75 80  
 Thr Gly Leu Asp Gly Lys Thr Glu Leu Gln Met Leu Ala Phe Lys Ser  
 85 90 95  
 Ser Lys Ile Arg Leu Leu Arg Ser Met Ala Ile Glu Asn Glu Thr Met  
 100 105 110  
 Gln Val Phe Asp Phe Ala Gly Phe Met Glu Pro Glu Tyr Asp Thr Pro  
 115 120 125  
 Ile Phe Cys Ala Asn Phe Phe Thr Ser Thr Asn Val Asn Ile Val Val  
 130 135 140  
 Leu Asp Leu Asn Pro Leu His Gln Leu Thr Asp Gln Thr Asp Tyr Gln  
 145 150 155 160  
 Asp Lys Tyr Tyr Asn Lys Ile Met Ser Ile Tyr His Lys Tyr Ala Glu  
 165 170 175  
 Thr Phe Pro Trp Gly Gly Lys Leu Thr Gly Glu Ser Ile Lys Phe Phe  
 180 185 190  
 Ser Pro Leu Val Met Trp Thr Arg Phe Ser Ser Ser Lys Glu Lys His  
 195 200 205  
 Lys Ala Leu Phe Ser Ala Phe Leu Glu Tyr Tyr Gln Ala Trp Leu Glu  
 210 215 220  
 Met Thr Ile Gln Val Arg Glu Glu Met Glu Pro Ser His Val Arg Ala  
 225 230 235 240  
 Asn Cys Glu Ala Gln His Lys Tyr Leu Thr Trp Arg Ala Gln Lys Asp  
 245 250 255  
 Pro Gly His Gly Leu Leu Lys Arg Leu Val Gly Glu Ala Lys Ala Lys  
 260 265 270  
 Glu Leu Leu Arg Asp Phe Leu Phe Asn Gly Val Asp Glu Leu Gly Thr  
 275 280 285  
 Lys Thr Phe Ile Asp Tyr Phe Pro Glu Tyr Gln Thr Glu Asp Gly Thr  
 290 295 300  
 Val Ser Asp Lys Arg Ser Ile Ile Gly Lys Ser Tyr Glu Thr Arg Pro  
 305 310 315 320  
 Trp Asp Leu Thr Gly Gln Phe Ile Gly  
 325

<210> 56  
 <211> 319  
 <212> PRT  
 <213> Arapidopsis thaliana

<400> 56

Met Ala Met Ile Phe Cys Asn Thr Leu Tyr Ser Ser Ser Ser Pro Ser  
1 5 10 15  
Tyr Leu Ser Pro Leu Thr Ser Lys Pro Ser Arg Phe Ser Lys Asn Leu  
20 25 30  
Arg Pro Arg Ala Gln Phe Gln Ser Met Glu Asp His Asp Asp His Leu  
35 40 45  
Arg Arg Lys Phe Met Glu Phe Pro Tyr Val Ser Pro Thr Arg Lys Gln  
50 55 60  
Leu Met Val Asp Leu Met Ser Thr Val Glu Asn Arg Leu Gln Ser Gln  
65 70 75 80  
Leu Leu Pro Cys Asn Leu Pro Pro Asp Val Arg Asn Phe Asn Asn Pro  
85 90 95  
Asn Gly Ser Ala Glu Ala Ser Leu His Ile Arg Ser Gly Asp Lys Ser  
100 105 110  
Ser Pro Ile Asp Phe Val Ile Gly Ser Trp Ile His Cys Lys Ile Pro  
115 120 125  
Thr Gly Val Ser Leu Asn Ile Thr Ser Ile Ser Gly Phe Leu Asn Ser  
130 135 140  
Ser Thr Lys Ala Pro Asn Phe Val Val Glu Leu Ile Gln Ser Ser Ser  
145 150 155 160  
Lys Ser Leu Val Leu Ile Leu Asp Leu Pro His Arg Lys Asp Leu Val  
165 170 175  
Leu Asn Pro Asp Tyr Leu Lys Glu Tyr Tyr Gln Asp Thr Ala Leu Asp  
180 185 190  
Ser His Arg Gln Ser Leu Leu Lys Leu Pro Glu Val Asn Pro Tyr Val  
195 200 205  
Ser Pro Ser Leu Phe Val Arg Ser Ala Phe Ser Pro Thr Ala Ser Met  
210 215 220  
Leu Lys Ile Asp Ala Glu Glu Glu Asp Lys Leu Glu Glu Ile Leu Arg  
225 230 235 240  
Asp His Val Ser Pro Ala Ala Lys Glu Val Leu Glu Val Trp Leu Glu  
245 250 255  
Arg Cys Val Lys Glu Glu Glu Glu Lys Ile Val Val Gly Glu Glu Glu  
260 265 270  
Arg Met Glu Leu Glu Arg Arg Asp Lys Ser Phe Arg Arg Lys Ser Ile  
275 280 285  
Glu Asp Asp Leu Asp Leu Gln Phe Pro Arg Met Phe Gly Glu Glu Val  
290 295 300  
Ser Ser Arg Val Val His Ala Ile Lys Glu Ala Phe Gly Val Leu

305

310

315

&lt;210&gt; 57

&lt;211&gt; 205

&lt;212&gt; PRT

&lt;213&gt; Hordeum vulgare

&lt;400&gt; 57

Met Asp Phe Met Leu Gln Ser Ser Leu His Cys Lys Val Pro Asn Gly  
 1 5 10 15

Ala Ile Asp Ile Thr Ser Leu Phe Ile Asn Leu Asn Ala Ser Thr Asp  
 20 25 30

Ala Pro His Phe Ile Met Glu Phe Ile Gln Gly Ser Pro Thr Ser Met  
 35 40 45

Val Val Leu Leu Asp Leu Leu Pro Arg Lys Asp Leu Ala Leu His Pro  
 50 55 60

Glu Tyr Ile Glu Lys Tyr Tyr Glu Asp Thr Glu Val Asp Lys Gln Arg  
 65 70 75 80

Lys Ile Ile Glu Gln Leu Pro Gln Ala Arg Pro Tyr Leu Ser Pro Ser  
 85 90 95

Leu Phe Val Arg Ser Ala Phe Ser Pro Thr Ala Val Phe Phe Thr Ile  
 100 105 110

Asp Cys Gly Lys Gly Gly Glu Gly Thr Leu Glu Glu Ile Val His Gly  
 115 120 125

His Leu Ala Ser Val Val Lys Gly Ile Leu Gln Ile Trp Leu Asp Thr  
 130 135 140

Cys Ala Ser Asp Ala Ser Glu Met Glu Glu Gly Glu Arg Glu Ile Met  
 145 150 155 160

Val Lys Arg Asp Arg Thr Val Arg Ser Lys Ser Ile Glu Val Asp Leu  
 165 170 175

Thr Ala Asn Leu Pro Arg Met Phe Gly Pro Asp Val Ser Gly Arg Ile  
 180 185 190

Ile Ala Glu Ile Arg Lys Ala Phe Gly Val Gln Glu Gly  
 195 200 205